Small Business Innovation Research/Small Business Tech Transfer

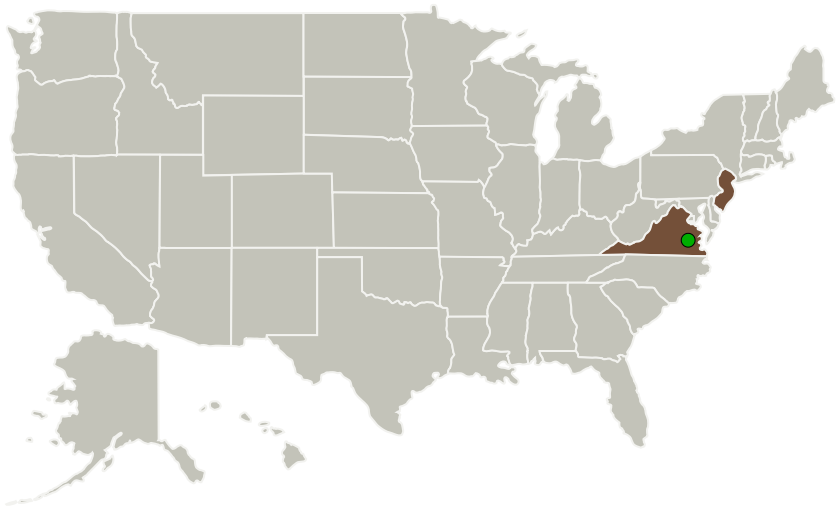
Autonomous Agricultural Application using Unmanned Aircraft, Phase II

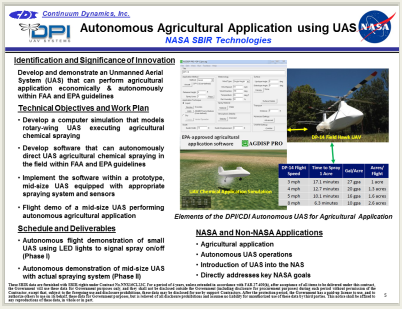
Completed Technology Project (2016 - 2019)

Project Introduction

Interest in Unmanned Aircraft Systems (UAS) for civilian use has increased greatly in recent years and is expected to grow significantly in the future. NASA is involved in research that would greatly benefit from advancing the ability of UAS to make autonomous real-time decisions based on sensor data. This SBIR effort will provide this capability, developing and demonstrating an intelligent controller for a UAS that can autonomously perform agricultural chemical spraying leveraging EPA-approved software and following NASA guidelines for suggested certification requirements for commercial UAS over 55 lbs. This is a high-value civilian application well-suited to autonomous UAS given the dangers posed by maneuvering manned aircraft at extremely low altitudes. This also serves as a test case for evaluating future UAS certification requirements. Phase I established feasibility by demonstrating the ability to perform the required onboard sensing, to establish communication between a UAS and flight controller at high enough bandwidth to allow inflight decision-making, and to execute a pre-determined flight path/spraying strategy autonomously. Phase II would see the design, development and implementation of a fully-autonomous, prototype system that can perform high-level decision-making during flight and satisfy NASA's draft certification basis for UAS performing precision agricultural spraying. The prototype system would install algorithms based upon existing EPA-approved spray drift management software within the autonomous flight control system. The end goal of the Phase II effort would be a flight demonstration of the prototype system consisting of a modified, midsize UAS spraying intelligently and autonomously, with high-level decision-making, within a relevant environment.

Primary U.S. Work Locations and Key Partners





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Organizations Performing Work	Role	Type	Location
Continuum Dynamics, Inc.	Lead Organization	Industry	Ewing, New Jersey
Langley Research Center(LaRC)	Supporting Organization	NASA Center	Hampton, Virginia

Primary U.S. Work Locations	
New Jersey	Virginia

Project Transitions

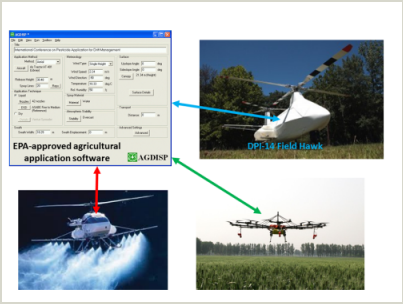
April 2016: Project Start

June 2019: Closed out

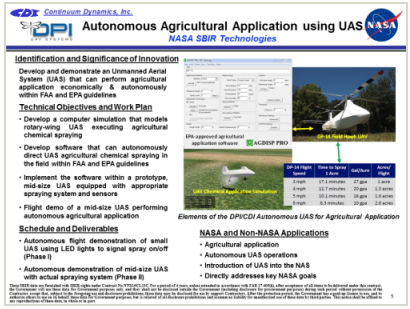
Closeout Documentation:

- Final Summary Chart*(https://techport.nasa.gov/file/139830)*

Images



Briefing Chart Image
Autonomous Agricultural Application using Unmanned Aircraft, Phase II
(https://techport.nasa.gov/image/132996)



Final Summary Chart Image
Autonomous Agricultural Application using Unmanned Aircraft, Phase II
(https://techport.nasa.gov/image/137158)

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Organization:

Continuum Dynamics, Inc.

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:

Jason L Kessler

Program Manager:

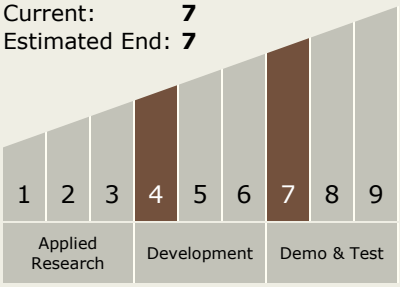
Carlos Torrez

Principal Investigator:

Daniel A Wachspress

Technology Maturity (TRL)

Start: **4**
Current: **7**
Estimated End: **7**



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Technology Areas

Primary:

- TX16 Air Traffic Management and Range Tracking Systems
  - TX16.1 Safe All Vehicle Access

Target Destinations

The Sun, Earth, The Moon, Mars, Others Inside the Solar System, Outside the Solar System